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ABSTRACT

Offered in this compendium of lessons are suggestions and guidelines for incorporating energy issues into the language arts curriculum at the secondary level. Among the learning strategies employed in these activities are sustained silent reading, debates, literature appreciation, interviews, assigned compositions, and reading comprehension exercises. The manual is presented as a starting point rather than as a definitive curriculum. (Author/WB)

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PENNSYLVANIA'S ENERGY CURRICULUM FOR THE SECONDARY GRADES

English

SE 034 454

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INTRODUCTION

"The problem, as anyone who has been involved in secondary education must know, is that departmentalization is both an organizational structure and an attitude. Teachers, trained as discipline-centered specialists, tend to occupy and defend their own intellectual territories, and incursions are viewed with a certain academic xenophobia." Neil Ellman, in a provocative article entitled "Science in the English Classroom,"[1] describes the tenacity with which educators too often cling to their particular domains. While his assessment can be generally applied to all disciplines, his remarks are addressed to the English teacher in particular. Are we *that* paranoid? In some ways, yes. We are threatened by the possibility of other disciplines intruding on our turf. "Who never to himself hath said, 'What does science have to do with English?'" And while we frequently are able to recognize the duties of others: "Every teacher is an English teacher"; we seldom are apt to admit that turn about is fair play.

There has been a great deal of pressure placed on educators in recent years to return to a mythical time when all who taught knew how to and all who went to school learned. Most of us only smile at such remarks and continue to stoutly defend our profession's integrity by charging that more students than ever are staying in the classroom, that students are far more sophisticated than their antecedents, and that the world is growing smaller and more complex all the time. The fact is times have changed and students do come to us with deeper and broader life experiences. So why apply the artificats and attitudes of a smaller and more simplistic educational world? Strict departmentalization and "academic xenophobia" are really remnants from those days when fewer students attended school and mass communications had less impact on them and our world.

This publication explores the implementation of a science/English interdisciplinary program – in particular the issue of energy and its use in teaching language arts skills at the high school level. It should be noted that because this is an introductory document and limited to one phase of the science curriculum, there is a great deal more development and expansion yet to be done. The activities and suggested procedures, viewed collectively, are only the tip of the iceberg.

The first step in setting up the interdisciplinary program is for the administration and English and science staffs to agree to the need. Once this has occurred, organizational meetings should be scheduled to begin planning and preparing implementation. Agendas for meetings should include the following:

A. Assessment of student needs

B. Identification of mutual educational concerns

C. Sharing of curriculum goals - English and science

D. Assignment of roles (including students)

E. Establishment of the interdisciplinary objectives

F. Establishment of an evaluation process

Some in-service activities may be required as a result of these sessions. In that case, exchange programs of an instructional nature could be offered periodically throughout the school year. For example, the reading specialist might be asked to demonstrate a directed reading activity or outline the steps taken to perform a readability on a particular text. An English teacher might be asked to discuss the appropriate form and content of a research paper, including the bibliography and footnote style followed in English classrooms (e.g., **MLA** or **Turabian**). The scope of these professional meetings, of course, will depend on the nature of the students', staffs' and instructional programa's needs. Whether the in-service program is limited or comprehensive in nature, the thrust will be to expand awareness, maintain open communications, and bolster mutual respect - three essential elements in any cooperative effort.

After the groundwork has been developed by the staff, the next step is to involve the students. They should be made aware that a cooperative effort is going to take place and, indeed, should be asked to offer suggestions as to the types of activities that would benefit them through such an undertaking. Again, Neil Ellman: "There is also a need to justify the connection to the students themselves, for by the time they reach secondary school, they are used to and easily accept the fine distinctions among courses and disciplines."[2] To neutralize this perception, high program visibility can be established through joint field trips, bulletin board displays, joint assembly programs, and assignments. Once the fundamental purpose for the program is identified for the students and a reasonable organizational structure established by staff, the business of implementing the plan can begin.

What follows are suggestions for incorporating energy issues into language arts curriculum. They are somewhat general in nature and arbitrary in choice and are offered as a framework only and, therefore, should not be construed as comprising a definitive curriculum. The suggested literary

passages, for example, are rather esoteric in nature. Their particular appeal is, no doubt, limited by student interest and ability. It should be stressed, however, that the exercises in the Responding to Literature section, like all other exercises here, are offered as suggestions and/or guidelines for the teacher. The application of the ideas found in this publication must always consider the interests and abilities of students and the instructional materials available to accommodate these parameters. The activities have been categorized under skill headings to facilitate reading, but it should be remembered that what is appropriate material for one teacher's debate activity is more suitable to another's writing assignment. Finally, there has been no attempt here to explore in depth the language sub-skills inherent in each of the four basic language arts (reading, writing, speaking and listening). Since programs of this nature should be geared to local need, such finite delineations must be made at that level.

Activity – Reading

Objective:

Students will engage in Self-Selected Sustained Silent Reading, an activity that will heighten positive student attitudes toward reading and strengthen reading skills. SSR provides the students with the opportunity to read purposefully for recreation as well as for information.

What to do:

1. Gather a classroom library. Your school or public library can help you rotate your collections, which should consist of books, magazines, journals, and newspapers appealing to a wide range of reading interests and abilities. Paperbacks have particular appeal for students at the secondary level.

2. At the beginning of each SSR period, introduce one or more of the books by reading from them or commenting about them.

3. Ask each student to select reading material particularly appealing to him/her.

4. Have everyone read. The teacher *must* read as well.

5. You may start with a period of three to five minutes if desirable, but build up to fifteen to thirty minutes as students show that they can handle that amount of time. Teachers in each major subject might set aside one half hour, one day a week for SSR.

6. At the end of SSR, give students an opportunity to voluntarily share something from their reading, but have students understand they are not required to do so.[3]

Teacher Notes:

Self Selected Sustained Silent Reading (SSR)

Educators have, in recent years, pushed for more "free" reading in the classroom – blocks of time afforded young people to read material they have personally selected with no specific assignment, no look-for-this-answer-while-you-read questions. It is reading for pleasure, information, or both. The major purpose of this appraoch (called Sustained Silent Reading or SSR) is to allow the students to return to print media in a totally relaxed, non-threatening environment. The feeling is that the schools too often have made reading an institutionalized phenomenon. SSR is an effective way to combat that attitude. Many English teachers already have extensive classroom libraries; many times, however, these libraries are comprised of materials with a literary flavor - novels, short story anthologies, books of poetry and essays. In implementing an interdisciplinary program, these libraries should be extended to include all types of reading materials. Since the focus here is with science, the teachers may want to provide a variety of science fiction literature (e.g. Bradbury, Asimov, and Clark), science journals and magazines (e.g. **Scientific American**, **Science News**, **OMNI**, and

Chemistry), scientific books (**The Sea Around Us** - Carson, **Gift From the Sun** - Cooper) and pamphlets and newspaper articles of particular interest to the energy-minded student. A meeting with the science staff and school librarian would help the English teacher identify a wide range of such material. Not only would such a library provide more interest areas for students, but it would also serve as a rich source of experiences for students in a number of writing styles.[4]

Activity – Reading

Objectives:

Students will strengthen their abilities in reading comprehension and factual recall.

What to do:

In addition to using the traditional fictional forms found in most secondary English classrooms, the teacher may offer students essays of exposition, persuasion, and argumentation. Appropriate passages about energy could be used for a number of activities: to study the essay form, to help strengthen reading comprehension, and to provide students an opportunity to read and discuss current issues affecting their futures. Before having the students read passages and answer questions, discuss with them the number of energy demands their life styles call for. You may want to list the responses on the board. Included below are several passages. After the students read these passages (or any others you may find appropriate to the subject of energy), have them complete individually or in small groups the questions and discuss and/or report their answers to the rest of the class. The passages and questions are printed on separate sheets to aid in reproducing them.

Answers to questions:

Exercise I, 1-a; 2-e; 3-c; 4-b; 5-c; 6-b; 7-d.

Exercise II, 1-e; 2-c; 3-b; 4-e; 5-e; 6-d; 7-a; 8-c; 9-c.

Exercise III, 1-c; 2-e; 3-d; 4-b; 5-a; 6-e; 7-e; 8-d; 9-d.

EXERCISE I

Passage One

Our demand for energy has increased about eighteen fold in the last century, and in our own lifetime the use of energy has been rising at a rate greater than four percent per year. The world's energy use has been increasing at an even greater rate, about six percent per year. In the United States, since 1950, population has increased by about ten percent, residential energy use by about fifty percent, and the country's total energy use by one hundred percent. With a relatively small population increase, why would residential energy use increase so much? A few answers are that all homes now have central heating, a hot water heater, a stove, a refrigerator, electric lights, a radio, and a television. Most homes today have a washing machine and many have air conditioning. Just since 1969, the number of homes with air conditioning has tripled. Dishwashers have increased fourfold in the same period. Many homeowners purchase frost-free refrigerators and color televisions, which both use more energy than their earlier counterparts –manual defrost refrigerators and black and white televisions. Transportation energy use has grown at a rate of about four percent per year, and the average increase for manufacturing as a whole is about eight percent per year. Obviously our energy usage has been increasing, and we have had a role in this.

Passage Two

The U.S. consumes more energy per capita than any other nation in the world. This high-energy use rate is reflected in every sector of our society-commercial, residential, industrial, and transportation. The commercial sector, the smallest of the four, includes businesses, government buildings, hotels, hospitals, restaurants, and offices. Half of their energy consumption went for space heating and air-conditioning. This sector has been growing at a faster rate than the others, and depends primarily on natural gas, oil, and electricity.

Space heating is also the single largest energy user in the residential sector, which is slightly larger than the commercial sector. The uses for which energy requirements are growing most rapidly are air-conditioning, clothes drying, and refrigeration. The rapid rise in air-conditioning has created a new problem for utilities–providing enough electricity to meet the disproportionately large demands at times of peak use. The result has been "brownouts" when the generating facilities reduce the amount of power delivered to each customer.

The transportation sector accounts for over one-fourth of our total national energy consumption. Clearly most of the transportation energy use is due to the movement of people and goods on U.S. highways, with oil accounting for essentially all energy consumed in this process.

Most importantly, while the transportation sector is second largest (25 percent) in terms of total energy consumption, an additional 15 percent of total energy consumption comes from the other three sectors to support the transportation complex. Energy is required not only to fuel transport machines, but also to build and maintain them. It is easy to understand why so much attention has been paid to improving energy efficiency in that sector.

The largest consumer of fuel energy in the U.S. is the industrial sector. Heating processes, either by manufacturing steam or by directly burning fuel, account for half of industrial fuel consumption. The industrial sector relies on three fossil fuels–oil, gas and coal.

All of the four major energy consuming sectors depend largely upon dwindling fossil fuels. It is essential that alternate energy sources be developed to replace these fuels. Present consumption patterns will help determine the priority that should be given various alternate energy resources over the next few years.

Questions on Exercise I. – Passages One and Two

1. Based on the information offered by the passage, which sector uses the most energy?

   a. industrial b. transportation c. residential
   d. commerical e. information not given in passage

2. Our energy demand has grown by how much in the last century?

   a. four percent b. eight times c. it has doubled
   d. eight percent e. eighteen times

3. Within the commercial and residential sector, which process uses the most energy?

   a. air conditioning b. small appliances c. space heating
   d. large appliances e. none of the above

4. In the residential sector, which processes have the fastest growing energy requirements?

   a. space heating, water heating and small appliances
   b. air conditioning, clothes drying, refrigeration
   c. air conditioning, space heating and small appliances
   d. air conditioning, water heating and small appliances
   e. none of the above

5. According to the passage, why has so much attention been paid to improving the energy efficiency of the transportation sector?

   a. because large energy savings can result from increased efficiency
   b. because that sector relies heavily on scarce fossil fuels
   c. because the transportation sector uses over a quarter of the total fuel energy consumption for operation, construction and maintenance
   d. all of the above
   e. none of the above

6. How has our demand for energy grown as compared to the growth in our pouplation?

   a. it has grown relatively little in comparison to population growth
   b. it has grown rapidly in comparison to population growth
   c. growth in both areas has been about equal
   d. energy demand has grown slightly less than population
   e. energy demand has grown slightly more than population

7. Which of the four sectors of the U.S. has the fastest growing demand for energy?

   a. industrial b. transportation c. residential
   d. commercial e. informtion not given in passage

Exercise II

Passage One

Pennsylvania's major energy fuels are coal, oil, natural gas, and uranium. Some of these fuels are in short supply. No one knows exactly how much of these fuels remain in the ground.

The estimated amounts of various fuels that can be extracted fall into two categories: reserves and ultimate reserves. Reserves are those supplies that are known to be present. Ultimate reserves are estimates by geologists as to how much fuel might be present in unexplored regions.

Energy reserve estimates are usually made on the basis of the amount of fuel present in a given location that can be extracted using existing technology and then sold at or near the present market value. As mining technology improves, and the price of fuel increases, a larger fraction of the resource becomes economically recoverable.

For example, oil wells stop producing when only about a third of the oil has been pumped out because the pressure in the ground has been reduced to the point where no more oil flows out of the well. Several methods of enhanced recovery are under study, which may result in the extraction of about 20 percent of the oil residual.

Our energy use has been out of balance with our energy supplies–in 1978, for example, 75 percent of our energy came from oil and gas which are the scarcest fuels, and only 20 percent from coal which is most plentiful.

We rely almost totally on energy supplies that are not renewable. Nature still forms the fossil fuels, but at a formation rate one million times slower than our consumption rate.

It is difficult to make estimates of the amount of fuel resources available. It is also difficult to predict how long these supplies will last. The United States government estimates that coal reserves will last 500 to 600 years, and that natural gas supplies and oil reserves may be exhausted at the end of the century. These estimates are based on certain assumptions about the rate of energy use. Estimates based on different assumptions will yield somewhat different predictions. **(From Pennsylvania Energy Curriculum for the Middle Grades)**

Passage Two

Pennsylvania's predominately coal-based electric utility sector is the nation's third largest producer of electric energy. Electricity is the most versatile form of energy; all fuels can be converted into electricity, and electric energy can be used to meet virtually every energy need. This versatility is a key to increasing the Commonwealth's energy self-reliance, since Pennsylvania's large coal reserves can be substituted for less abundant supplies of petroleum and natural gas in the generation of electricity.

Over half of the total amount of coal consumed yearly in Pennsylvania is used to generate electricity. This primary reliance on coal is supplemented by using 6 percent of the

oil consumed yearly in-state and all of the existing nuclear and hydroelectric capacity to generate electricity.

Natural gas, although a major state energy source, is in short supply and has been discontinued as a primary fuel source for electrical generation.

Oil is slowly being reduced as a primary fuel source due to uncertainties in its continued supply and its relatively high price in comparison to coal and nuclear fuels.

Consequently, the Commonwealth's generating capacity is evolving toward a coal/nuclear mix and away from the recent coal/oil/gas configuration. The expansion of hydropower, the cleanest and most inexpensive power source, is constrained by the absence of acceptable dam sites that remain to be developed in Pennsylvania. **(Pennsylvania Energy Primer)**

Questions on Exercise II, Passages One and Two

1. Which fuel source presents the fewest pollution problems?

   a. coal b. oil c. natural gas d. nuclear e. hydropower

2. Which three fuels are major energy sources for Pennsylvania?

   a. coal, uranium, water b. coal, solar, natural gas
   c. coal, oil, natural gas d. coal, uranium, solar
   e. none of the above

3. Why is electricity considered the most "versatile" form of energy?

   a. because it can be used to power most machines
   b. because it can be produced from many different fuel sources
   c. because it is clean and non-polluting
   d. because it is in unlimited supply
   e. none of the above

4. How long will coal resources last, according to U.S. government estimates?

   a. 100-200 years b. 200-300 years c. 300-400 years
   e. 500-600 years

5. What are the major advantages of using coal to produce electricity in Pennsylvania?

   I. It is non-polluting
   II. It can easily be mined
   III. It is abundant
   IV. It is low in price

   a. I only b. I and II c. II and III d. III and IV
   e. III only

6. Why is it difficult to estimate how long energy supplies will last?

   I. Rates of usage cannot be accurately predicted
   II. The rate at which fuels become available through natural processes cannot be predicted
   III. Geologists can only estimate available resources
   IV. Technology for recovering reserves may improve

   a. I only b. II, III and IV c. I, II and IV d. I, III and IV
   e. I, II and IV

7. How much of the coal consumed in Pennsylvania each year is used in the production of electricity?

a. over one half b. one-third c. over two-thirds
d. three-fourths e. all of it

8. According to the passage, in what way has our energy use been out of balance with our energy supplies?

a. demand has exceeded supplies
b. too much emphasis has been placed on non-renewable energy supplies
c. we have relied too heavily on the fuels that are in the shortest supplies
d. we have used fuels without knowing the amount available
e. none of the above

9. What fuel sources are presently being emphasized for production of electricity in Pennsylvania?

a. coal/natural gas b. coal/oil/gas c. coal/nuclear
d. oil/nuclear e. hydro/coal

Exercise III

Passage One

Conserving our scarce energy sources may avert serious energy shortages while alternate sources of energy are being developed. Energy savings can be realized by all segments of the population through changes in methods of transportation, better methods of heating and cooling buildings, and implementation of energy conservation efforts in industrial processes.

The greatest potential for energy savings in the household lies in reducing space heating requirements. Space heating alone accounts for an average of 72.3% of the average household's energy use. Reducing a winter thermostat from 72 degrees F. to 62 degrees F. can provide the homeowner with a 14% savings in fuel consumption. This is particularly important since 84 percent of Pennsylvania residences use oil and gas, the scarcest fuels, for heating.

Improving the thermal efficiency of homes may conserve more energy than lowering the thermostat, without sacrifices in comfort. Thermal efficiency can be improved through installation of ceiling and wall insulation, by installing storm windows and doors, and by weather stripping and caulking.

Savings can also result from conservation of hot water. Hot water heating accounts for 14.2% of the average householder's energy needs. Hot water can be conserved by directly lowering temperature settings and taking showers instead of baths. Hot water systems can be made more efficient by insulating the water heater and exposed hot water pipes.

Industrial firms may be more aware of energy conservation techniques than individual homeowners, but sometimes industries do not implement energy saving methods. Often, the most energy efficient processes are not the most economical. It may be less expensive to consume a little more energy than to invest in new energy-efficient processes. Additionally, some industrial processes –such as production of plastics and aluminum – are very energy intensive.

Automobiles consume nearly 68.4% of transportation energy, yet have the lowest energy efficiency rating for all modes of transportation except airplanes. Therefore, increasing the use of public transit and reducing the inefficient use of automobiles will reduce our dependence on petroleum supplies. (Adapted from the **Pennsylvania Energy Primer**)

Passage Two

Many alternate sources of energy have been discussed since the 1973 oil embargo brought the energy crisis to the attention of the American public. The most frequently discussed alternate energy source is direct use of the sun's radiation to meet space heating and cooling requirements and to heat water. Other energy sources that are being explored for increased use are windpower, bioconversion, ocean thermal conversion, and geothermal heat.

Solar energy systems that supply homes with hot water and space heating and cooling can be of two types. Active systems involve solar energy collector panels and an energy

storage device. Radiant heat from the sun is absorbed by the collector panels, and heats fluid flowing through the panels. The heated fluid goes to the energy storage device where its heat is given off. Passive systems simply make maximum use of the sun's warmth in winter and of shade in the summer through building design and landscaping. Active solar systems are presently very expensive to install, and in most places a back-up conventional unit is needed.

Energy from the wind in the continental United States is estimated to represent five times the country's current total energy consumption. However, wind is widely dispersed and warrants consideration as an energy source only in sections of the country where it is sufficiently intense and dependable. Wind power also requires a large initial investment.

Ocean thermal energy conversion takes advantage of the significant temperature differentials between the surface waters of the ocean and the water below, which is not heated by the sun's rays. In some tropical areas the deeper waters can be as much as 40 degrees F. colder than the surface waters. One potential problem with this approach is that transportation of the energy produced by ocean thermal energy conversion to the areas where it is needed may be difficult.

Trapped within the earth's surface is a vast supply of geothermal energy. To be tapped, these heat reserves must be close to the surface of the earth. Pennsylvania does not have any significant usable geothermal resources.

Bioconversion, which is being used experimentally in California, releases the energy stored in plants through the photosynthetic process. Plants that have high energy content would be grown specifically for use as fuels. Another aspect of bioconversion is the use of organic wastes–garbage, sewage, agricultural and food wastes–to produce energy. Although organic wastes may never make more than a minor contribution to energy supplies, conversion of these wastes may be increasingly important as disposal sites are more difficult to find. (Adapted from **The Pennsylvania Energy Primer**)

Questions for Exercise III, Passages One and Two

1. Would you characterize the style of Passage One as

   a. exhortatory b. humorous c. expository d. subjective
   e. none of the above

2. What would be a good title for Passage One?

   a. Energy Savings in Residentail Buildings
   b. Modern Industry and Energy
   c. Energy Conservation as the Answer to the Energy Crisis
   d. Energy Usage of Modern Society
   e. Energy Conservation: A Short-term Solution

3. According to Passage One, what energy conservation measure may contribute most to energy savings in a private home?

   a. lowering temperature settings on hot water
   b. lowering the thermostat
   c. taking baths instead of showers
   d. insulating the home
   e. none of the above

4. According to Passage One, why would an industry not implement an available energy savings process?

   I. The industry may not be aware of the energy savings process
   II. Using more energy may be more economical
   III. Energy efficient processes are always more costly to implement

   a. I only b. II only c. III only d. I and II e. II and III

5. What is the least efficient transportation mode?

   a. airplanes b. cars c. public transit d. trucks
   e. none of the above.

6. Of the alternate energy sources discussed in Passage Two, which is most adaptable to Pennsylvania?

   a. geothermal b. windpower c. ocean thermal conversion
   d. solar e. not possible to determine from information given

7. Problems with the use of windpower include:

I. High capital investment required
II. Problem of transporting energy produced by wind to areas that need it
III. Need for a back-up unit in case wind power fails
IV. Dispersed nature of wind

a. I and II b. I and III c. II and III d. IV only
e. all of the above

8. Of the alternate energy sources discussed in Passage Two, which does the author mention as not being a potential source in Pennsylvania?

a. solar b. ocean thermal c. wind d. geothermal e. bioconversion

9. What title do you think is appropriate for Passage Two?

a. Advantages and Disadvantages of Alternate Energy Sources
b. Energy Sources of Tomorrow
c. Replacing Fossil Fuels: Alternate Energy Sources
d. Alternate Energy Sources: An Overview
e. none of the above

Teacher Notes:

Passages like the preceding ones provide the English student an opportunity to read forms of non-fiction – an experience frequently relegated to the back burner in the English class, unfortunately. In addition, such essays readily lend themselves to the teaching of vocabulary skills (affixes and context), locational skills (graphs, figures and tables), and comprehension skills (following directions, sequence, organizational, main idea inference, and supporting detail).[5] The reading specialist would be a valuable resource person for the English teacher in planning reading and study activities of this nature.

Activity – Responding to Literature

Objective:

Because literature examines the ethical and moral truths of life, it remains an effective vehicle for launching all types of responsive activities. Since the issues raised by the energy crisis are frequently of a moral and ethical nature, the English class discussion about a literary selection can be easily extended to include the passage's relevance to an energy question. The students will respond to literature reading assignments in terms of their implications for energy issures.

What to do:

The following exercises are designed to use various literary forms to launch student response.

Exercise I - Drama

Henrik Ibsen's "Enemy of the People" entertains the idea of truth and morality in conflict with economics. After the play is read, students could be encouraged to parallel the play's dramatic tension with the clash between environmentalists and energy industrailists; with alternative energy sources advocates and big business lobbyists.

Arthur Miller's "All My Sons" raises the question of a man's responsibility to his fellow human beings. The play could provoke a variety of assignments focusing on the difference between people's basic needs and their desire for wealth and power; between conservation and extravagance.

Exercise II - Poetry/Song/Prose

A. "Stopping By a Woods" by Robert Frost could be used to initiate a discussion on the role that energy plays in pacing our lives. The poem deals with a man riding in a horse-drawn carriage. How does the mode of transportation compare with the attitude and atmosphere of the poem? How might they change if the poet had taken some other form of transportation? Has something been lost by our progress towards more rapid transit methods?[6]

B. "Just a Little Rain" and "Whose Garden Was This" are protest songs which deal with the hazards of nuclear power to the environment. The teacher may want to share these and other similar lyrics with the students and then ask them to compose songs of their own relative to this or other energy issues of today. Some of the more musically inclined students might set the lyrics to music and perform them for the class.

C. The issue of the beauty of undisturbed nature could be surveyed throughout the school year because the subject has been a popular literary focus for centuries, particularly in poetry. Students who would take an environmentalist's point of view in a class discussion, debate, or composition should be encouraged to quote liberally from such literature and writers for justification and support. Listed below are some starters:

To me the meanest flower that blows can give
Thoughts that do often lie too deep for tears.

William Wordsworth

I love not man the less, but Nature more.

Lord Byron

Art is man's Nature; nature is God's art.

Philip Bailey

Some keep the Sabbath going to church;
I keep it staying home,
With a bobolink for a chorister,
And an orchard for a dome.

Emily Dickinson

Inebriate of air am I,
And debauchee of dew
Reeling, through endless summer days,
From inns of molten blue.

Emily Dickinson

I went to the woods because I wished to live
deliberately, to front only the essential facts
of life, and see if I could not learn what it had
to teach, and not, when I came to die, discover that
I had not lived.

Henry David Thoreau

A man and what he loves and builds have but a day
and then disappear; nature cares not – and renews
the annual round untired. It is the old law, sad but not
bitter. Only when man destroys the life and beauty of
nature there is the outrage.

George Macaulay Trevelyan

One impulse from a vernal wood
May teach you more of man
Of moral evil and of good,
Than all the sages can.

William Wordsworth

After you have exhausted what there is in business,
politics, conviviality, and so on – have found that
none of these finally satisfy, or permanently wear – what
remains? Nature remains.

Walt Whitman

D. Parodies of Longfellow's "My Lost Youth" which would spotlight the spending of natural resources for the sake of energy demands could be written and recited.

E. Points of comparison in discussing the American dream as it relates to the extravagant and self-indulgent lifestyles of Americans evidenced by the disregard for natural resources and the belated effort to recognize and regulate pollution could be made using the themes of such writers as Walt Whitman, Theodore Dreiser, F. Scott Fitzgerald, and Mark Twain as discussion spring boards.

F. Having studied the socio-economic influences of the Puritan ethic on the American lifestyle, as well as the effect of the Transcendental movement on the American conscience, students could be led into a discussion (drama, story, composition) of how these two forces continue to surface in national debates as evidenced in the energy-based conflict between big business interests and environmentalists. Thoreau, Emerson, Hawthorne, and Arthur Miller would be excellent sources to use.

G. Nantaniel Hawthorne's "The Birthmark" concerns a scientist's attempt to improve nature - to create perfection from imperfection. At the expense of his morality, the scientist caters to his personal desires. The story might be used to launch a dialogue between those who advocate the continuing progress of humanity despite the threats this progress holds, and those who advocate a conservative restraint that would serve to perpetuate the positive qualities of people. In energy terms this could translate into a debate on the pros and cons of nuclear generation or strip mining, for example. Another reference to use would be Eliot's "Hollow Men."

H. The myth of Dedalus and Icarus, since it is frequently thought of as the archetypal tragedy of human limitations, could be used in an assignment examining people's efforts to control their desires given the boundaries of their natural environment.

Teacher Notes:

Because literature is basically a reflection of the human condition recorded and preserved for us, it remains a rich source for discussions relative to the human system of values – the moral footprints of our history. It, therefore, lends itself to any subject wherein humankind struggles with its collective conscience.

Activity – Written Composing

Objective:

The student will engage in a variety of written composing experiences.

What do do?

The following exercises are designed to offer the students a wide range of writing assignments highlighting elements of effective writing and employing the subject of energy. Besides providing composing experiences, these exercises are also intended to indirectly help students analyze the impact of energy on their individual and societal lifestyles. Students should be encouraged to discuss the various topics that follow from a variety of perspectives, including the economic, the political, and the social. In Exercise I, for example, the student is asked to write a piece on future energy sources. Ideally, the student should try to visualize and then write about the effect new sources of energy will have on a variety of human activities including travel, modes of dress, architectural design, land use, work habits, and the relationships of various groups in society.

Exercise I

Ask the students to write a piece describing what the world will be like in the future when new energy sources are developed.

Exercise II

Have each student write an "Energy Bill of Responsibilities," aimed at making the individual aware of his/her responsibilities in energy conservation. Encourage the students to discuss the various trade-offs that must be made to conserve energy. For example, wearing more clothing in the winter to permit the thermostat to be lowered may conflict with the student's sense of fashion.

Exercise III

Ask the students to describe how the energy crisis has affected their families' lifestyles. This exercise lends itself to being done as a dialogue or play–perhpas a conversation among family members as they discuss what changes they have made since the energy crisis began.

Exercise IV

Ask the students to write an essay about the energy crisis. This could become a

contest, with the best essay appearing in the school or class newspaper. Students should be encouraged to take any one of many approaches to the energy crisis, including: Does it really exist? Can energy conservation efforts be implemented by any family? Should the government ration energy supplies? Can energy industries or the public be held responsible for the crisis?

Exercise V

Have the students write a piece on the use of energy-efficient transportation methods. How would life be different? Would life be more difficult, better, or a little of both? How much energy could these modes of transport save? Does the energy-efficient transport have disadvantages as well as advantages?

Exercise VI – Diaries

A. Ask students to imagine themselves scientists exploring new sources of cost-efficient energy and to record their daily experiences in a diary. The day-by-day accounts should reveal various phases of progress and attitude (e.g., doubt, frustration, boredom, anxiety, excitement, and triumph).

B. Students pretend to be inhabitants of the planet Xercon who have been invited to earth to observe our methods of transportation. They are required to keep diaries of their daily experiences and describe in detail the methods of transportation and the advantages and disadvantages of such methods. (A follow-up activity could have the students delivering speeches to the "Council of Wisdom" back home – a type of debriefing affair.)

Exercist VII – Letters

Letter writing will not only permit students to practice a rather stylized writing form, but it will provide an important source of informational literature for a variety of other class activities as well. For example, gas and electric companies could be asked to respond to questions relating to:

-Energy waste and subsequent shortages

-Rising costs of energy

-Alternative energy sources

-Nuclear energy – pros and cons

-Natural gas

-Synthetic natural gas

Local chapters of the Chamber of Commerce could be called and asked to supply material concerning community energy supplies and pollution controls. Students could find in the library the addresses of large oil companies and solicit responses from them concerning energy problems. Student letters to editors and congressmen asserting opinions and calling for

plans of action could also be encouraged. (See Appendix of Introductory Module for addresses of many energy-related organizations)

Exercise VIII – Research Papers

A. Before requiring the student to complete formal research assignments, propose that they work in teams to review and evaluate material that is available about energy. Have them collect 20-30 energy publications (See Appendix of Introductory Module for sources). Have the students develop critieria for evaluating the material, including answers to the following:

1. Who designed and funded the study?

2. Did the authors make any general assumptions that influenced their conclusions?

3. Did the authors clearly state how data was obtained and how conclusions were reached?

4. Does it appear that the study was conducted to further support a previous action or position that had already been decided upon by an agency or a special interest group?

5. Were the sources of information used in the report reliable, accurate, and up-to-date?

6. Did the authors look for, describe, and select from alternatives when arriving at solutions or conclusions?

7. Did the authors address all aspects of the problem–economic, environmental, social, and political?

These activities will give students a basic source of reference materials for all other composing exercises and encourage critical reading, an important skill in research, writing, and assessing the work of others.

B. While still in the organizational phase of planning the inter-disciplinary program, teachers may want to cooperatively develop a list of possible research subjects. Planners may want to review the list with the school librarian before distributing it to students. Some suggested topics for research:

-Unique Energy Sources in Science Fiction.

-Magnetohydrodynamic Power, Anyone?

-What You Always Wanted to Know About Breeder Reactors But Were Afraid to Ask.

-Goin' Fission: A Commentary on Nuclear Power.

-You Are My Sunshine – Solar Energy

-What in the World is Geothermal Energy?

-Newspapers and the Energy Crisis: A Study of Journalistic Coverage.

-"The Sound and The Fury" - What Politicians, Businessman, and Environmentalists are Saying About _____.

-The Energy Crisis: Who Is To Blame?

-Energy and Environmental Regulations: Can They Live Happily Ever After?

-The National Energy Policy.

-"Not With a Bang But a Whimper" - An Assessment of Nuclear Power Production and Regulation.

-Solid Waste - A New Energy Source?

More specifically, ask the students to research and write reports on energy availability in Pennsylvania. The students should be able to identify many sources of information including: government, industry and conservation groups, and published studies by academics–as statistics on energy supplies and demand can differ. A list of places to write for energy information and a bibliography are included in the Appendix of the Introductory Module.

Exercise IX – Creative Writing

A. Encourage students to write short fiction, poetry and/or drama using a particular energy issue as the focus (e.g. pollution, depletion, hazards, energy in the future). Students should create their work from a specific perspective (e.g. moral, ethical, political, or economic). The students could be asked to imitate the form and style of a particular writer or demonstrate their understanding of a variety of literary techniques by employing them in their compositions based on the literature read in class or through SSR. The teacher may wish to submit the best of these creative endeavors to the school's literary magazine editor or publish a classroom booklet for dissemination in other schools and the community.

B. Students could be asked to publish their own public service brochure employing the knowledge and skills gained through class work and independent research. The publication might focus on one aspect of the field of energy which has relevance to the community (ways to conserve energy, for example) or it might generally survey several important energy issues (pros and cons of nuclear power). The booklet might take the form of how to or simply serve to promote public awareness. Such an undertaking will involve all students participating in one form of composing or another. Writers, editors, and illustrators will be needed. Decisions about purpose and content should involve teachers and students. Such items as definitions, formal and informal essays, editorials, poems and stories should be considered. The completed document may be sent out to the community, distributed to community clubs, and disseminated to other grade levels and schools.

Teacher Notes:

The possibilities of written composing activities using the subject of energy are only as limited as the teacher's imagination. The preceding suggestions should be viewed as basic frameworks upon which substantive exercises providing comprehensive writing experiences can be fashioned. There has been no attempt here to identify specific writing skills. The needs and abilities of the students should dictate these; nevertheless, any writing activity, if it is to be worthwhile and purposeful for the students, must be well-planned, clearly stated, sufficiently motivating, and worthy. Most importantly, the students should know from the outset what they are being asked to write and why.

Activity –Oral Composing

Objective:

The student will compose a variety of oral forms.

What to do:

The following exercises acquaint the students with the art of oral composing *and* make them think about energy while they are learning this skill. If time permits, the class would benefit from witnessing a formal debate of non-classmembers. If there is a debating club in your community, or at a nearby college, (or in your high school for that matter), you might try to arrange for the students to witness a debate or to talk with one member of a debating team. In addition, someone who teaches public speaking, or who must frequently speak to the public, may be willing to give the students pointers on good public speaking techniques as well. As in the case of independent research topics, teachers may want to cooperatively organize a list of suggestions for oral compositions. These presentations could be individual speeches, group debates, and/or discussions.

Exercise I - Class Debate

Questions: Should nuclear power plants be constructed in large numbers to meet growing energy demands?

A national debate over the use of nuclear energy has been going on for several years. Thus, material on this topic should be readily available. To prepare for the debate, the students may contact organizations that support and oppose nuclear power, research magazines and newspapers, read books, and get information from governmental agencies.

The students may start by contacting power companies. The following companies service various parts of Pennsylvania, and may have information on nuclear power plants: Pennsylvania Electric Company, Pennsylvania Power Company, Dusquesne Light, West Penn Power Company, Pennsylvania Power and Light, Metropolitan Edison, and Philadelphia Electric Company. The Pennsylvania Electric Association, a trade association of electric power companies, or the Atomic Industrial Forum, a national trade association, will probably supply the students with material on nuclear power.

Students should also contact environmental and conservation groups. Local Sierra Clubs or Audubon Societies may be able to provide literature on nuclear energy. A state group called Citizens Coalition Against Nuclear Power has been working against nuclear power. National groups like the Natural Resources Defense Council and the Union of Concerned Scientists are well known for their opposition to nuclear energy. (Addresses for these and other groups listed here and below appear in the Appendix of the Introductory Module.)

The students can also consult books that have been written about nuclear energy.

The Nuclear Regulatory Commission is the federal government body that is responsible for regulating nuclear power. The Pennsylvania Public Utility Commission is the state agency with this responsibility. The U.S. Senate Energy and Natural Resources Committee oversees the activities of the Nuclear Regulatory Commission, and deals with legislation relating to nuclear energy. This committee may be able to supply students with information on nuclear safety.

Nuclear energy is often covered by newspapers and magazines. Have the class research media coverage of nuclear power.

Current books on Nuclear Energy:

Nuclear Power: Issues and Choices, The Nuclear Energy Policy Study Group, Discusses President Carter's nuclear policy.

Energy Technology Handbook, Douglas M. Considine, Ed., Basic data on current energy sources.

Soft Energy Paths: Toward a Durable Peace, Amory Lovins, Discusses alternatives to dangers of nuclear power and fossil fuel pollution.

Earth, Water, Wind and Sun, D. S. Halacy, Jr., Discusses benefits and drawbacks of non-fossil fuel and non-nuclear power sources.

Critical Mass: Nuclear Power. The Alternative to Energy Famine, Jacques Srouji, A non-experts guide to nuclear power.

Nuclear Power Safety, J. H. Rust.

Exercise II - Class Debate

Question: Can coal be safely and economically used to replace other scarce fossil fuels?

Pennsylvania has large coal resources, and many people feel that coal should be emphasized as a fuel source in order to curb reliance on oil and natural gas. Coal does present some problems, as its use may conflict with environmental quality goals and its mining can be dangerous.

Have the students consult magazines and newspapers (particularly Pennsylvania

newspapers) for information about coal. The Department of Energy and the Environmental Protection Agency may be able to provide information about coal supplies and on the environmental problesm associated with coal. The Pennsylvania Department of Environmental Resources should be able to give the students informtion on coal supplies in Pennsylvania, on problems of mine reclamation, and on safety problems associated with coal mining. The Federal Office of Surface Mining also will have information of this nature. There are some books and periodicals that disucss coal as an alternative energy source.

The Economics of Kentucky Coal, Curtis E. Harvey, Analysis of the Kentucky coal industry.

Energy Technology Handbook, Douglas M. Considine, Ed., Discusses various energy sources and their prospects for the future.

Fueling the Future: Energy Sources and Environmental Effects, Richard T. Sheahan.

"Will Coal Be Tomorrow's 'Black Gold" National Geographic (August, 1975.)

Coal In Today's World, National Coal Association.

National groups that may be able to offer information about coal as an energy source are the Environmental Policy Center and Friends of the Earth. Both are concerned with energy development. The U.S. Senate Committee on Energy and Natural Resources has jurisdiction over coal-related legislation.

Exercise III - Class Debate

Question: Will solar power, wind power and geothermal energy ever contribute a significant quantity of energy to the United States?

All three of these energy sources are being developed, at least experimentally. The students may debate the viability of all three or select one of them for discussion.

Students should have little trouble getting information on solar energy. The Franklin Institute in Philadelphia has resources in this area. The Pennsylvania Environmental Council, also in Philadelphia, has some information in its library on solar energy. The National Solar Heating and Cooling Information Center in Rockville, Maryland is another source of solar energy information.

Private organizations that operate on a national level may have information on alternate energy sources. They include: the Critical Mass Energy Project, Environmental Action, Inc., Resources for the Future, and Solar Action. Governmental agencies with information on alternate energy sources are the Department of Energy, the National Academy of Sciences, and the National Science Foundation. Again, the students should consult magazines and newspapers for information on alternate energy sources.

Some books on alternate energy sources:

Energy: The Continuing Crisis, Norman Metzger.

Energy: Global Prospects 1985-2000, Massachusetts Institute of Technology, Workshop on Alternative Energy Strategies.

Soft Energy Paths: Toward a Durable Peace, Amory Lovins.

Earth, Wind, Water and Sun, D. S. Halacy.

Sun Power: An Introduction to the Application of Solar Energy, J. C. McVeigh.

Exercise IV - Class Debate

Question: Is energy conservation a viable way to cut down on our increasing energy demand?

Students should explore various energy conservation measures and try to determine how much energy each will save. Students should be prepared to discuss the following: the effect of energy conservation on individual lifestyles; the role of the government in the implementation of energy conservation; and the role of business and industry in energy conservation. While it may be difficult to dispute the value of conservation, the person representing the "con" side of this debate may want to argue that energy conservation conflicts with individual freedom, and will make very little difference to overall energy demand.

The Pennsylvania Governor's Energy Council and the U.S. Department of Energy are good sources of energy conservation information. Power companies (see Exercise One) may also be able to supply information on energy conservation measures.

National organizations that may have information on energy are the Department of Energy, the Department of the Interior, and the Department of Housing and Urban Development. The House Committee on Science and Technology and the Senate Committee on Energy and Natural Resources are concerned with energy matters.

Current books on energy conservation include:

Let There be Energy: A Program for Today and Tomorrow, William M. Brown and Herman Kahn.

99 Ways to a Simple Lifestyle, the Center for Science in the Public Interest.

In Command of Tomorrow: Resource and Environmental Strategies for Americans, Sterling Burbaker.

Energy Savers Catalogue, Consumer Guide.

The Complete Energy-Saving Home Improvement Guide, Compiled and Edited by the Educational Research and Services Corporation.

Energy Saving Home Improvements, U.S. Department of Housing and Urban Development.

Exercise V - Class Debate

Question: Should energy prices reflect the true replacement cost of energy?

The "replacement cost" of energy refers to the amount of money it would take to produce a given amount of energy at current market prices. Energy in the United States today is not always priced at its replacement cost because a variety of government policies influence pricing decisions. Some people argue that energy should be priced according to its replacement cost in order to encourage conservation. Others believe that this method will provide energy companies with underserved windfall profits and would contribute to inflation.

Students should check business magazines for articles on how energy pricing policies are developed (**Fortune** or **Business Week** are two periodicals that might discuss this topic.) The U.S. Department of Commerce would also be able to provide information on this.

Private organizations that may have information on energy pricing include: The American Enterprise Institute, National Energy Project, American Petroleum Institute, Gulf Oil Company, Sun Oil Company, the Ford Foundation's Energy Policy Project, the National Petroleum Council, Consumer Federation of America, the Environmental Policy Center, and the Energy Action Educational Foundation. The addresses of all these groups are listed in the appendix.

Many books have been written about the economics of energy. Among them:

The National Energy Plan-1977, Executive Office of the President.

Families in Energy Crises, Robert Perlman and Roland L. Warren.

The Poverty of Power, Barry Commoner.

Energy Economics, Helmut A. Merklein and W. Carey Hardy.

Exercise VI - Public Speaking

Have the students prepare formal speeches. Some suggestions:

-Energy and Energy Alternatives

-Why Solar Energy?

-Fossil Fuel or Nuclear Power? Or both?

-Off-Shore Oil Drilling – Pros and Cons

-New Energy Sources

-Is Nuclear Power Hazardous to Our Health?

-Future Visions of Energy Consumption

-Is the "Snail Darter" Only the Beginning?

-How Will the United Stated Dispose of Its Nuclear Wastes?

-Is Nuclear Power Environmentally Safe?

-The Pros and Cons of Offshore Nuclear Power Plants

-Can Coal be Made "Clean" Enough to Meet Air Quality Standards?

-Methods of Surface Reclamation After Mining

-Coal and Pennsylvania's Economy

-Geothermal Energy: An Explanation of the Process

-Energy Sources for the Year 2000

-Solar Power in Pennsylvania

-How to Reduce Your Energy Consumption

-Energy Conservation for Industry

-How to Build an Energy-Efficient Home

-The Effect of the Energy Crisis on the Economy

-President Carter's Energy Plan

Exercise VII - Discussion Groups

Have the students divide into small groups. Each group will represent the views of one segment of society on the issue presented below. Students may choose to represent energy industry members, environmentalists, government officials on the federal, state or local level, individuals, stockholders in energy companies, representatives of low income groups, industrial and commercial firms that use energy, and countries that export oil to the United States.

Issue: The students, keeping in mind the needs of the class of individuals they are representing, should discuss the types of government policies they would recommend to make sure that sufficient affordable energy is available.

One group of students should address the many factors that go into setting government policy in such a complex area. Should energy supplies be rationed? Should the government put a ceiling on prices or regulate profits? How can the government insure that exploration for mineral energy sources and experimentation in new forms of energy continue? What arguments can be made for or against treating classes of energy consumers differently? How can the government encourage conservation?

Exercise VIII - Discussion Groups

Have the students discuss the following issue from a variety of perspectives they must identify.

Issue: What are the advantages and drawbacks to the use of the various sources of energy that are, or will be, available in Pennsylvania? Who should be responsible for making decisions about which energy sources are used, and how they are used?

Exercise IX - Discussion Groups

Have the students divide into small groups and again assume some or all of the various identities described in Exercise VII as they discuss the following:

Issue: If energy shortages become very severe, should environmental standards be relaxed as an energy conservation measure? What decision does the class reach?

Exercise X - Small Group Discussions

Have the class prepare programs on energy conservation to be given in a school assembly, over the public address system, or to community organizations. The students should divide the program into three parts: the first describing the evidence that leads them to believe that conservation of fossil fuel energy is needed; the second suggesting ways in which individuals can save energy, and the amount of energy each method can save; and the third presenting potential energy sources that may replace fossil fuels. (NOTE: Check with local radio or television stations. They may be willing to donate some time for presentation of the program as part of their public service efforts.)

Exercise XI - Oral Activities

In a manual for teaching environmental education concepts to secondary school students, author Barry Jamason[7] proposes that students compose oral presentations based on relevant quotes assembled by the teacher. Some of his suggestions:

"Behold the turtle: he makes progress only
when he sticks his neck out."

James B. Conant

"Value determines what we ought to do, not
what one necessarily desires to do."

Dorothy Rethlingshafer

"All is Change; all yields its place and goes."

Euripedes

"For as long as man has dwelt upon this earth spring has
been the season of rebirth and the singing of birds.
Now in some parts of America spring has been strangely
silent, for many of the birds are dead."

Rachel Carson

"Too many cars, too many factories, too much detergent, too
much pesticide, multiplying contrails, inadequate sewage
treatment plants, too little water, too much carbon dioxide
. . . all can be traced easily to too many people."

Paul Ehrlich

Other considerations are:

"We shrink back from the truth if we believe that the destructive forces of the modern world can be brought under control simply by mobilising more resources – wealth, education, and research – to fight pollution, to preserve wildlife, to discover new sources of energy, and to arrive at more effective agreements on peaceful coexistence . . ."

E. F. Schumacher

"Science is vastly more stimulating to the imagination than are the classics."

J. B. S. Haldane

"Nature never did betray
The heart that loved her."

William Wordsworth

"Necessity is the mother of invention."

Anonymous (Latin Proverb)

"How weary, stale, flat and unprofitable
Seem to me all the uses of this world."

Shakespeare

"Once to every man and nation comes the
moment to decide,
In the strife of Truth with falsehood, for
the good or evil side."

James R. Lowell

"We should often be ashamed of our very best actions,
if the world only saw the motives which caused them."

La Rochefoucauld

"Architecture is the printing press of all ages, and gives
a history of the state of the society in which it was erected."

Lady Morgan

"Tis education forms the common mind:
Just as the twig is bent the tree's inclined."

Alexander Pope

"No man is an island, entire of itself; every man is
a piece of the continent, a part of the main . . .
and man's death diminishes me, because I am involved
in mankind, and therefore never send to know for whom
the bell tolls; it tolls for thee."

John Donne

"Nature understands no jesting. She is always true,
always serious, always severe. She is always right,
and the errors are always those of man."

Johann Wolfgang von Goethe

"Nature is neutral. Man has wrested from nature the
power to make the world a desert or to make the
deserts bloom. There is no evil in the atom; only
in man's souls."

Adlai Stevenson

"Truly the light is sweet, and a pleasant thing it
is for the eyes to behold the sun."

Ecclesiastes 11:7

(The final four quotations above are the suggestions of the Energy Education Advisory Council in a curriculum publication entitled "Energy in Our Society.")

Exercise XII - Interviews

A. Assign interviews with energy spokespersons as part of the independent research projects or as primary activities themselves. Tapes of these interviews with appropriate student introduction and accompanying written scripts could be presented to the rest of the class.

B. Invite a representative of the local power company, a member of an environmental group, a congressperson, or a business executive to hold a press conference in the classroom. The student reporters, duly prepared through independent reading (See Exercise VIII -Written Composing), would pose questions to the speaker. If such resource people are not available,

students themselves could take turns role playing the guest and field questions from the audience.

C. Ask the students to interview several elderly citizens in the community for their personal assessments of changes in society's attitudes about energy, energy uses, costs, and kinds. Students could then make a comparative study between "then and now" and share the results with the rest of the class.[8]

Exercise XIII - Guest Speakers

Guest speakers representing various special interest groups could be asked to speak to the classes. They may appear alone or with others in debates or panel discussions. Students should be encouraged to actively participate in question and answer sessions that follow the presentations of outside speakers.

Exercise XIV - Role Playing

Role playing, another oral composing activity, provides the opportunity for students to demonstrate their range of knowledge and exhibit their creative flair.

A. Each student is asked to play a leading scientific figure whose reputation in the field is legendary. The "scientist" is invited to speak to a group of school children about his/her contribution to science. The language of the speech should be commensurate with the level of audience understanding – Einstein speaking to Mr. Crawford's third grade science class, for example. Such role playing activities should include but not be restricted to scientists. Henry D. Thoreau, Walt Whitman, Mark Twain, Huck Finn, Emily Dickinson, William Faulkner - all would certainly have something to say about the energy crisis.

B. One student is asked to fancy himself a millionaire; another, the president of an off-shore oil drilling company; another, a nuclear power plant executive; and another, a small businessman wishing to start a hydrofoil system to transport New York City commuters during rush hour. Each company representative asks the millionaire for funds to help finance the business operation and offers all sorts of reasonable justifications. The millionaire, interested in alleviating the oil crisis, makes his choice and explains his decision.[9]

C. The teacher places the students in small groups. Each group acts as the President's energy task force charged with making long and short term recommendations regarding alternative modes of transportation in the light of the energy shortage.[10] A similar activity, using the same format, would be to charge the groups with writing a national energy policy and presenting that policy to the "President" (class) for approval.

D. Select a committee of four or five students and ask them to write a combined physical, social, economic, and occupational description of a fictitious community, similar to their own. The description should include the natural environment within which the community is located and several conditions or problems which threaten elements of the natural environment and thus, in turn, threaten the human community itself. The committee should then edit this report (with teacher assistance) and duplicate it for all members of the class.

After the students have read the description, inform them that they are to engage in a role-playing activity. They are to make a list of the representative types of roles for people in

the community and then each student should select a role he would like to assume. The list of representative roles might be something like this:

-housewife
-mother
-real estate agent
-land owner
-bank president
-secretary
-high school student
-construction worker
-immigrant
-politician (local)
-store-owner
-homeowner
-apartment dweller[11]

Teacher Notes:

These oral activities give students a chance to practice their speaking skills as well as offer them the opportunity to strengthen their critical listening skills. Many of these exercises can be used to develop students' organizational and teamwork skills and their abilities to articulate.

Activity – Mass Media

Objective:

The students will be provided the opportunity to discover the nature and substance of mass media by employing their various forms.

What to do:

Mass media, combining writing and speaking skills with the visual arts, provide a solid base from which to launch still more English/science activities. Slide shows, picture essays, films, and animated shorts could be created by the students.

Exercise I

Suggested topics for slideshows, picture essays, story boards, and films include:

-Community Uses of Energy

-Energy Wastes

-Energy Conservation

-Community Pollution

Exercise II

Designing advertising campaigns is another mass media activity. Students are placed in small "ad agency" groups and assigned various ad campaigns. For example, one agency could be asked to develop a conservation campaign for an environmental group or governmental agency. Another may be charged with devising a series of advertisements for luxury automobiles (gas guzzlers). Other assignments include:

-A propaganda campaign for a totalitarian government determined to brainwash its population into conserving energy

-A campaign for a pollutant product

-A campaign for a mass transit system

Exercise III

Students should collect two to four current articles about energy from newspapers and magazines. Ask the students to summarize them and comment upon them, answering the following questions:

-What point of view does the author hold?
-What other information might the author have included to provide a more balanced view of the subject?
-What audience did the writer address? Does his/her language seem appropriate to this audience?
-Does the author appear to be biased? How does he/she reveal this?

Exercise IV

Have the students monitor different mass media to see how they cover energy problems. Have the students prepare a would-be television documentary on how media cover energy problems. How critical is one medium with another or itself?

-Are citizens getting adequate information about the energy crisis?
-What other information do people need to make decisions about energy?
-What are the most important groups the media needs to reach to affect policy?
-How is commercial advertising responding to the energy crisis?
-Do citizens exercise control over the kind of advertisements seen on radio and T.V.? If so, how?

Exercise V

Have the students prepare questions for an in-depth interview with a person who owns a solar home or produces solar equipment. After reviewing the questions with them, have the students break up into teams (the number of teams to be determined by the number of solar home owners or producers of solar equipment in your area) and have each team interview one person. Then, have the students write up the interview as a "feature" article for the newspaper. Students should include questions to obtain the following information:

From solar homeowners:

-Why did the person decide to install a solar unit?
-Was it difficult to find someone to install it?
-How long did the installation take?
-How often do they rely on their back-up unit?
-Have they been saving money on their energy costs? If not, do they think they will save money in the future?

-How long will it take for the unit to pay for itself?

For solar producers:

-What made them decide to produce solar equipment?
-Do they deal with other heating and cooling devices as well?
-How big is their market? Have they seen a growth in the market since they began producing the equipment?

Exercise VI

Have the students prepare questions for an interview with a person over seventy years of age. Ask him/her to describe how energy use has changed since they were young. Have students write a magazine or news article from the interview, contrasting the person's attitude and experiences with their own attitudes and experiences.

Exercise VII

Have the students prepare a survey to administer to adults from different households to find out how the oil embargo and the subsequent energy crisis affected their family life. Have each student interview one household (not his own parents) and then combine the collective responses into a magazine or newspaper article.

Exercise VIII

Devote part of the school newspaper, or all of the class newspaper, to the energy issue. Include: editorials, news articles, cartoons, features, interviews.

Exercise IX

Ask the students to write an editorial or news article responding to the question:

Is the energy crisis real?

Teacher Notes:

The exercises in the Mass Media section are designed to allow students the opportunity to engage in oral and written composing activities that are addressed to the masses. This not only helps the students identify the positive aspects of mass communication, but it exposes the negative side as well–the propaganda campaign for example. Audience, point of view, and attitude are important concepts for young writers to grasp, and offering them experiences with mass media provides this needed dimension for their expressive well beings.

[1]Neil Ellman, "Science in the English Classroom," **English Journal**, LXVII (April, 1978), p. 63.

[2]**Ibid.**

[3]Morton Botel. **The Pennsylvania Comprehensive Reading and Communication Arts Plan**, Pennsylvania Department of Education, (Harrisburg: Bureau of Curriculum Services), p. 7.

[4]Ellman, p. 63.

[5]Judith Thelen, **Improving Reading in Science**, International Reading Association (Newark, Delaware), p. 11.

[6]New Jersey State Council for Environmental Education, **Environmental Education, Energy - Transportation**, 1975 (Montclair, New Jersey).

[7]Barry W. Jamason, **Living Within Our Means: Energy and Scarcity**, New York State Education Department, (Albany: Office of Instructional Services), p. 18.

[8]New Jersey State Council for Environmental Education.

[9]**Ibid.**

[10]**Ibid.**

[11]Jameson, p. 14.